

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
21 November 2002 (21.11.2002)

PCT

(10) International Publication Number  
**WO 02/092418 A1**

(51) International Patent Classification<sup>7</sup>: **B62M 3/04**

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(21) International Application Number: **PCT/IT01/00492**

(81) Designated States (*national*): JP, US.

(22) International Filing Date:  
25 September 2001 (25.09.2001)

(84) Designated States (*regional*): European patent (AT, BE,  
CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC,  
NL, PT, SE, TR).

(25) Filing Language: English

(26) Publication Language: English

**Declaration under Rule 4.17:**  
— *of inventorship (Rule 4.17(iv)) for US only*

(30) Priority Data:  
RM2001A000256 15 May 2001 (15.05.2001) IT

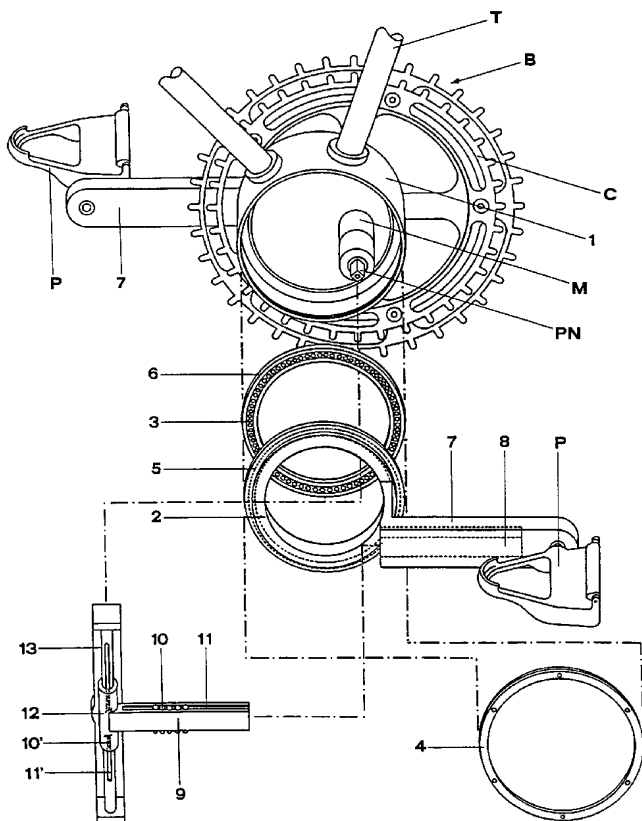
**Published:**  
— *with international search report*

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: A DEVICE FOR PROLONGING THE PEDAL CRANKS OF A BICYCLE DURING THE PUSHING PHASE



(57) Abstract: A device for prolonging the pedal strokes of a bicycle during the pushing phase, for realizing pedal strokes without discontinuity and dead points during rotation, comprising: - a housing (1) for a pedal crank (2) and bearings (3) that facilitate the movement thereof; - pedal cranks (2) provided with housings (5) for containing the ball bearings (3) and projections (7) carrying pedals (P), said projections (7) are provided with cavities (8) that allow the sliding of lever arms (9); - lever arms (9) sliding inside said projections (7) of the pedal cranks (2), linked with sliders (12) in turn sliding on special brackets (13) having their fulcrum in the pins PM of the bicycle hub (M) or similar, in a position orthogonal to said lever arms; - a crown (C) shaped in such a way as to allow the working of said pedal cranks (2) and of said lever arms (9) without interfering with the drive of the gear group and with the transmission gearing, usually present in competition bicycles.

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## A DEVICE FOR PROLONGING THE PEDAL CRANKS OF A BICYCLE DURING THE PUSHING PHASE

- 5     The present invention concerns a device for prolonging the pedal cranks of a bicycle during the pushing phase, for realizing pedal strokes without discontinuity and dead points during rotation.

From a previous document WO 00/43263 in the name of the same applicant  
10    an improvement of the devices for prolonging the pedal cranks of bicycles during the pushing phase is known, which – even if considerably improving the rotation of the pedal cranks with respect to the precedent devices known to the art, while testing still showed the presence of little but noticeable accelerations in correspondence with the dead points of rotation.

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It is the aim of the present invention to eliminate above mentioned functional inconveniences of the precedent device by means of a different structure and a different functional coupling of the elements of said device.

- 20    The aim set forth is reached by an improved device according to the present invention, comprising:
- a housing for the pedal cranks and bearings that facilitate the movement thereof;
  - pedal cranks provided with housings for containing ball bearings and  
25    projections carrying the pedals, said projections are provided with cavities, that allow the sliding of lever arms;

- lever arms sliding inside the projections of the pedal cranks, linked with sliders in turn sliding on special brackets having their fulcrum in the pins of the bicycle hub or similar, in a position orthogonal to said lever arms;
- a crown shaped in such a way as to allow the working of said pedal cranks and of said lever arms without interfering with the drive of the gear group  
5 and with the transmission gearing, usually present in competition bicycles.

The present invention will be described more in detail hereinbelow relating to the enclosed drawings in which an embodiment is shown.

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Figures 1 and 2 respectively show a left and right lateral view of a device for prolonging the pedal cranks according to the present invention, as applied to a competition bicycle B, while figure 3 shows an exploded view of the same.

- 15 Figures 4, 5, 6 and 7 show the different prolonging and shortening positions obtained by the pedal cranks during the resting, pushing and climbing phases of pedals P.

The enclosed figures show an improvement of the devices for prolonging the pedal cranks of bicycles in the pushing phase, consisting of:

20

- a housing 1, realized on the frame T of a bicycle B in an eccentric position to a hub M of the bicycle, and that contains pedal cranks 2 and bearings 3 which will facilitate their movement, and which are kept in position by special blocking nuts 4;
- 25 - pedal cranks 2 provided with housings 5 for containing ball bearings 3, kept by a blocking bottom 6, and for projections 7 carrying pedals P, said

projections are provided with cavities 8 which allow the sliding of lever arms 9;

- lever arms 9, sliding inside the projections of pedal cranks 2 by means of ball bearings 10 inserted into grooved guides 11, linked to slides 12 in turn sliding on special brackets 13 by means of bearings 10' and guides 11',  
5 having their fulcrum in pins PN of the hub M of the bicycle B, in a position orthogonal to said lever arms;
- a crown C shaped in such a way as to allow the working of said pedal cranks 2 and of said lever arms 9 without interfering with the drive of the  
10 gear group and with the transmission gear usually present on competition bicycles.

As far as the working of the device for prolonging the pedal cranks of a bicycle during the pushing phase, for realizing pedal strokes without  
15 discontinuity and dead points during rotation according to the present invention is concerned, the push exerted onto pedals P starts the rotation of pedal cranks 2 inside the special housing 1 on said frame T of said bicycle B, kept in position on the corresponding bearings 3 by said blocking nuts 4 and by said brackets 13 carrying said lever arms 9 on said pins PN of said hub M  
20 of the bicycle.

Due to the different rotation centres, the distance between the end of said projections 7 carrying said pedals P and the fulcrum of said lever arms 9 tends to increase in the pushing phase on the pedals and to decrease during  
25 the climbing phase, thus determining a proportional sliding of said pushing arms 9 inside said cavities 8 of the pedal cranks' 2 projections.

Now this sliding determines, in the pushing phase, a total prolongation of the lever arms which causes in turn an increase of the power applied by said arm to pedals P and a following increase of the moment transmitted to the wheels as well as a shortening of said lever arms in the climbing phase.

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Furthermore, as shown in figures 4, 5, 6 and 7, the sliding of the lever arms 9 onto the brackets 13, through the slides 12 linked to said lever arms, corresponds to the sliding of said arms 9 inside the cavities of the projections 7, due to the rotation of said brackets 13 onto the pins PN of the hub M  
10 determined by the action of the pedal cranks 2.

The combination of above mentioned movements seems to be able to prevent mechanical blocks of the system, thus assuring the perfect alignment of the elements in reciprocal rotation, as well as to obtain a pedal stroke without  
15 discontinuity nor dead points and keeping a constant distance between the rotation centre of the pedal cranks 2 and the end of the projections 7 carrying the pedals P, in any moment of said rotation.

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**CLAIMS**

1. A device for prolonging the pedal cranks of a bicycle during the pushing phase, for realizing pedal strokes without discontinuity and dead points during rotation, **characterized in:**

- 5       - a housing (1), realized on the frame (T) of a bicycle (B) in an eccentric position to a hub (M) of the bicycle, and that contains pedal cranks (2) and bearings (3) which will facilitate the movement of said pedal cranks, and which are kept in position by special blocking nuts (4);
  - 10       - pedal cranks (2) provided with housings (5) for containing ball bearings (3), kept by a blocking bottom (6), and for projections (7) carrying pedals (P), said projections are provided with cavities (8) which allow the sliding of lever arms (9);
  - 15       - lever arms (9), sliding inside the projections (7) of said pedal cranks (2) by means of ball bearings (10) inserted into grooved guides (11), linked to slides (12) in turn sliding on special brackets (13) by means of bearings (10') and guides (11'), said brackets (13) having the fulcrum in pins (PN) of the hub (M) of the bicycle (B), in a position orthogonal to said lever arms;
  - 20       - a crown (C) shaped in such a way as to allow the working of said pedal cranks (2) and of said lever arms (9) without interfering with the drive of the gear group and with the transmission gear usually present on competition bicycles,
- so that the proportional sliding of said lever arms (9) inside said cavities (8) of the pedals' (2) projections (7) determines, in the pushing phase, a total
- 25       prolongation of the lever arms which causes in turn an increase of the power applied to the pedals (P) and a following increase of the moment

transmitted to the wheels as well as a shortening of said lever arms (9) in the climbing phase.

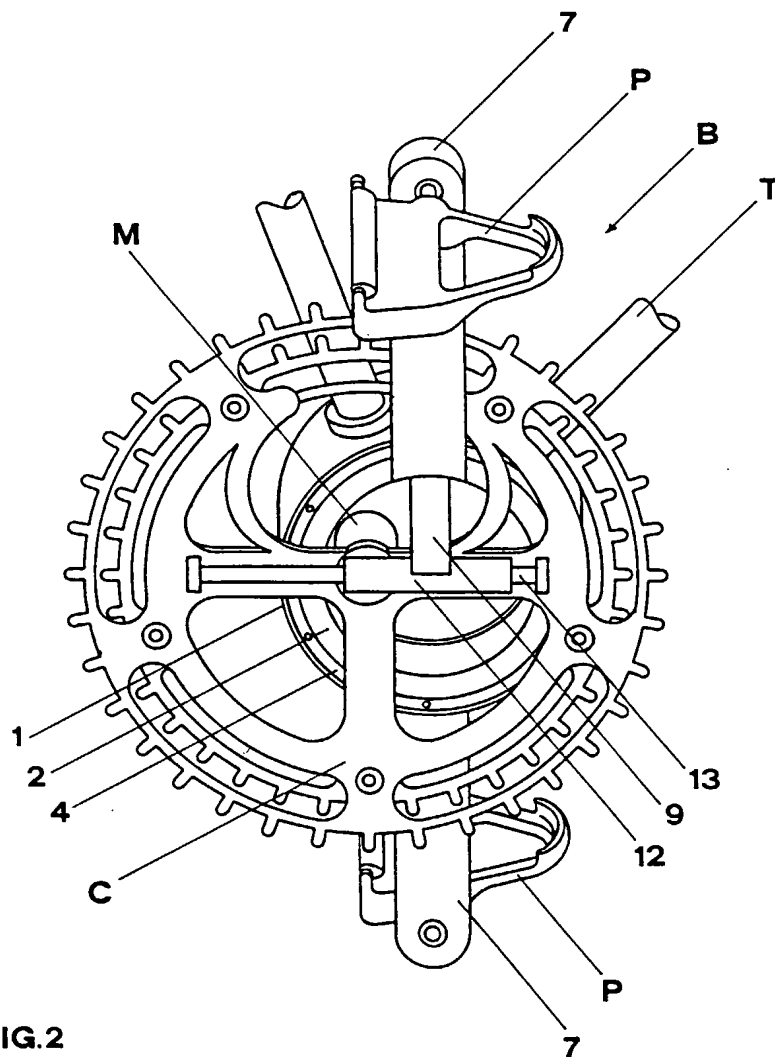
2. A device according to claim 1, **characterized in that** the sliding of the lever arms (9) onto said brackets (13), through slides (12) linked to the said lever arms, corresponds to the sliding of said lever arms (9) inside the cavities of said projections (7), due to the rotation of said brackets onto said pins (PN) of the hub (M) determined by the action of said pedal cranks (2), so that the combination of said movements prevents mechanical blocks, thus assuring the perfect alignment of the elements in reciprocal rotation, obtains a pedal stroke without discontinuity nor dead points and keeps a constant distance between the rotation centre of the pedal cranks (2) and the end of said projections (7) carrying the pedals (P), in any moment of said rotation.

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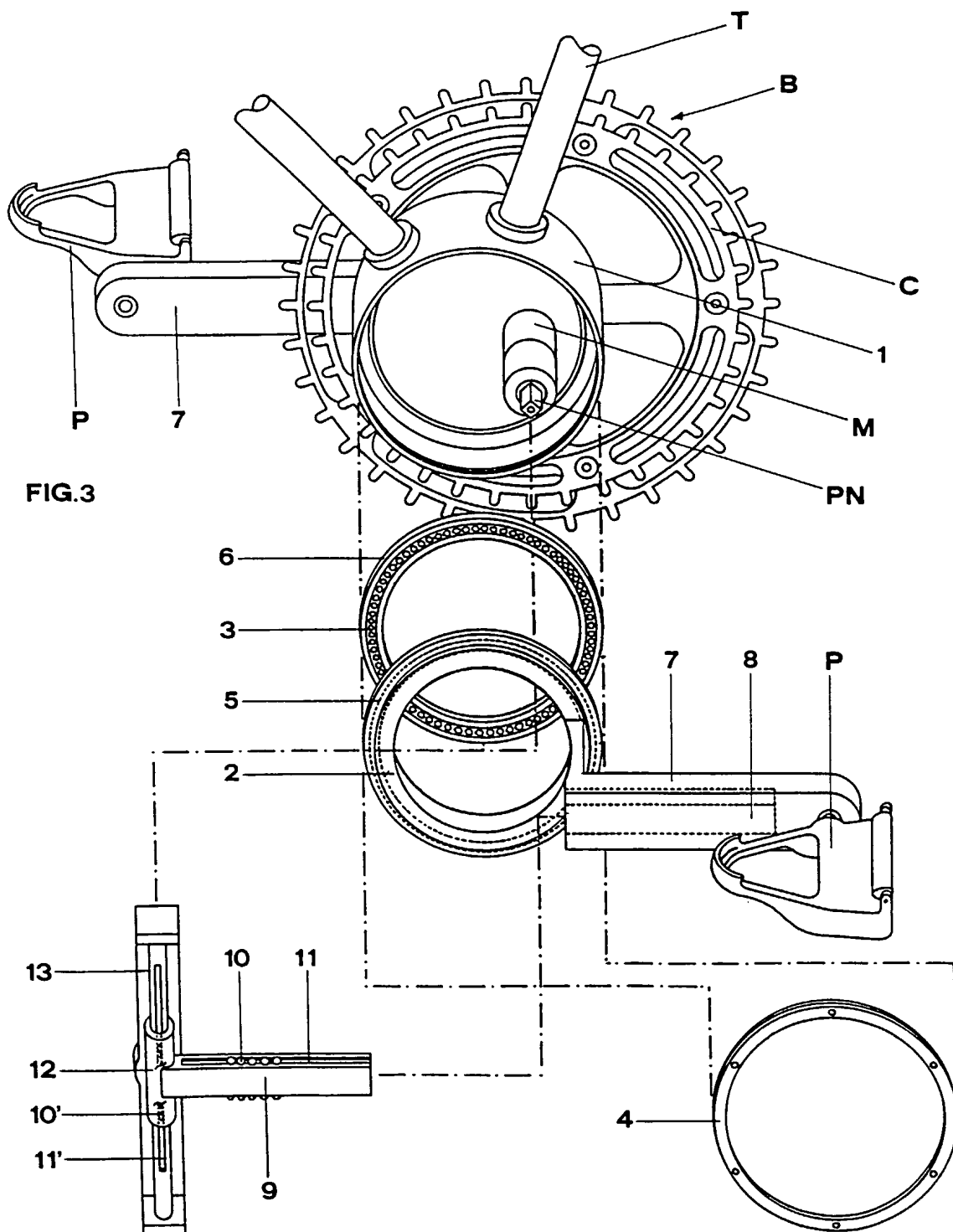
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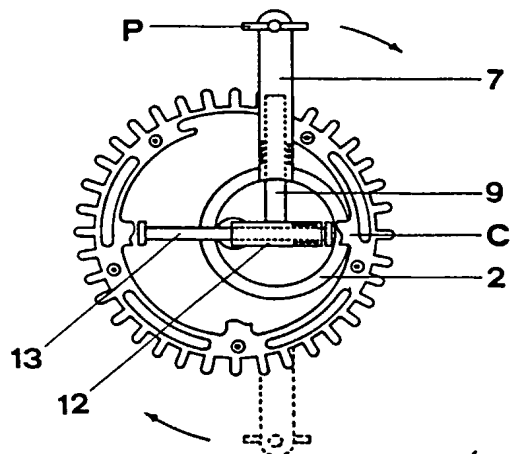


FIG. 4

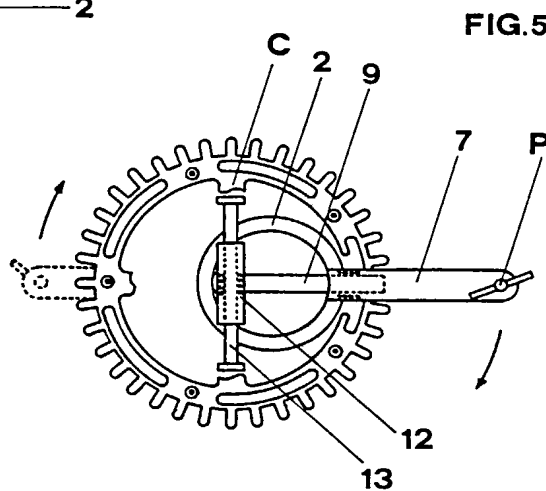


FIG. 5

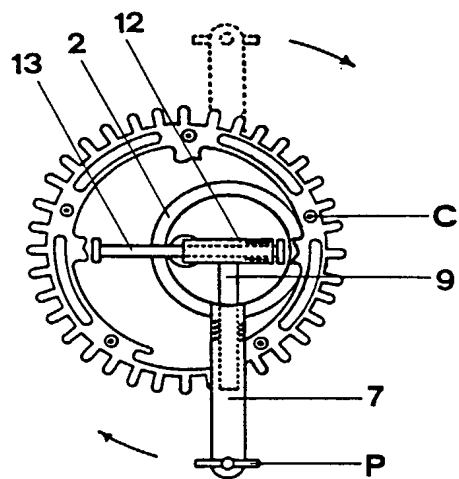


FIG. 6

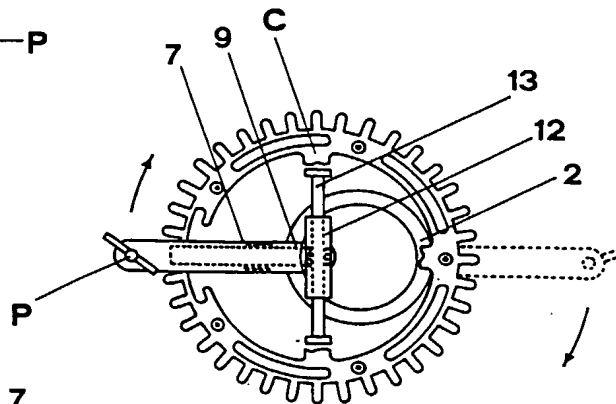


FIG. 7

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 01/00492

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B62M3/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B62M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00 43263 A (PEDDIS) 27 July 2000 (2000-07-27) cited in the application the whole document ---	1
A	GB 2 324 988 A (BLACKETT) 11 November 1998 (1998-11-11) abstract ---	1
A	EP 0 093 201 A (STUCKENBROK) 9 November 1983 (1983-11-09) abstract -----	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

18 January 2002

Date of mailing of the international search report

31/01/2002

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## INTERNATIONAL SEARCH REPORT

In <sup>al</sup> Application No

PCT/IT 01/00492

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